3. ADVANCED MIXED WASTE TREATMENT PROJECT FACILITY DESCRIPTION AND ALTERNATIVES

3.1 The Advanced Mixed Waste Treatment Project Facility

The Advanced Mixed Waste Treatment Project (AMWTP) facility would be located at the Radioactive Waste Management Complex (RWMC) in the southwestern corner of the Idaho National Environmental and Engineering Laboratory (INEEL). Figure 3-1 is a map of the RWMC that also shows the location of the RWMC at the INEEL. The AMWTP facility would be designed, built, and operated by BNFL Inc. (BNFL), under a privatized contract with the U.S. Department of Energy (DOE). Under the BNFL contract, the contractor cannot treat waste from sources other than DOE.

The AMWTP facility would be located in the Transuranic Storage Area (TSA) of the RWMC. Figure 3-1 shows the location of the AMWTP facility at the RWMC. Figure 3-2 is a three-dimensional view of the TSA showing the AMWTP facility in its proposed, as-built location. The facility would have the capability to treat specified INEEL waste streams, with the flexibility to treat other applicable INEEL and DOE onsite and offsite waste streams.

The goal of the AMWTP facility is to treat low-level mixed waste (LLMW), alpha-contaminated LLMW (alpha LLMW), and transuranic (TRU) waste to produce final waste forms that are certified for disposal. TRU waste would be disposed of at the Waste Isolation Pilot Plant (WIPP) in Carlsbad, NM. LLMW would be disposed of at an approved disposal facility depending on decision to be based on DOE's *Final Waste Management Programmatic Environmental Impact Statement* (WM PEIS). The AMWTP facility would be designed specifically to treat approximately 65,000 cubic meters of primarily LLWM, alpha LLMW, and contact-handled (CH) TRU from the RWMC. The facility may also process up to 120,000 cubic meters of additional waste from the INEEL and other DOE sites, for a total of up to 185,000 cubic meters. The facility would be designed with an operational life of approximately 30 years. Operation of the facility for its entire design life would depend on DOE approval and the availability of additional waste for treatment after the 65,000 cubic meters of INEEL waste were treated. The AMWTP draft RCRA permit application to operate the AMWTP facility incorporates the requirements for closure and decontamination and decommisioning (D&D) of the facility. However, because of project unknowns such as when the facility will cease operation, and if it can be used for other purposes at the end of this project (e.g., processing other types of DOE wastes) the D&D of the AMWTP facility is not analyzed in detail in this document. When D&D of the facility is anticipated, DOE would conduct an appropiate NEPA review.

3.1.1 Advanced Mixed Waste Treatment Project Facility Description

The AMWTP facility is proposed to be on the southern portion of the 56-acre TSA, between the existing TSA Retrieval Enclosure (TSA RE) to the west, and the seven RCRA compliant Type II storage modules to the east (Figure 3-1). The proposed AMWTP facility would be located near the center of the TSA, which would avoid moving retrieved wastes across public roads for treatment. The waste requiring retrieval is stored in the TSA RE just west of the proposed AMWTP facility. The Type II modules used for interim storage of drums and containers of the retrieved waste are located adjacent to the east side of the proposed AMWTP facility. Other buildings, such as the Type I module and the TRUPACT-II Loading Facility, are also located near the AMWTP facility (Figure 3-1). Therefore, waste retrieved from the TSA RE would remain within the boundaries of the TSA until transport to final disposal or to subsequent treatment locations.

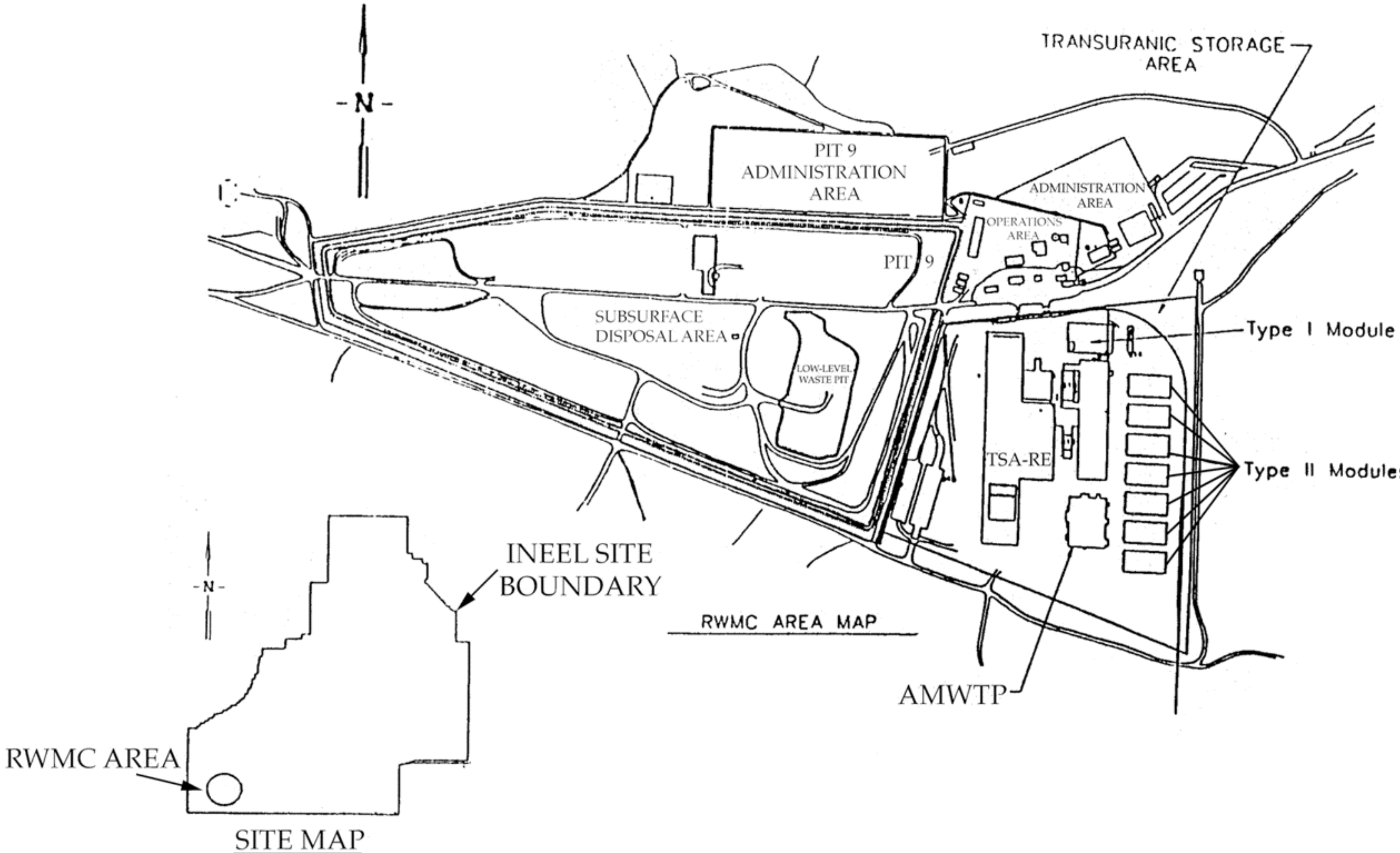

Figure 3-1. Location of the AMWTP facility.

Figure 3-2. Three-dimensional view of the TSA, showing the AMWTP facility.

The AMWTP facility layout would be designed for material handling and process flow requirements. General arrangement, elevation, and section drawings can be found in the AMWTP *Resource Conservation and Recovery Act* (RCRA) Part B Permit Application located in the INEEL Technical Library in Idaho Falls, Idaho.

The proposed AMWTP facility would be designed as a two-story industrial type structure with a rooftop mechanical penthouse. Overall dimensions for the first (ground) floor are approximately 210 feet x 290 feet. The general building height is about 42 feet. The facility houses approximately 60,000 square feet per floor. The rooftop mechanical penthouse encloses approximately 20,000 square feet of additional space and is about 60 feet above ground level at the eave. The facility stack extends from the north end of the building and is enclosed by a structure approximately 19 feet square. The stack (actually a windscreen enclosing seven individual flues) is about 10 feet in diameter and approximately 90 feet high. Further detailed information on the stack can be found in Appendix B, Facility Description Information.

The process portion of the building is generally described as having two levels, but many of the spaces are open from the first floor to the roof structure; others have mezzanine levels or intermediate equipment access platforms. Operations and maintenance personnel may access various work areas via a continuous corridor system around the perimeter of the process area and a central operator corridor on the second floor that separates the non-thermal pretreatment/treatment areas from the thermal treatment areas.

The proposed AMWTP facility would be divided into three ventilation confinement zones. Use of the three ventilation zones minimizes the potential for air contaminated with either radioactive or hazardous materials to be released to the environment. All air within the AMWTP facility flows from the outside through the administrative areas into Zone 1, which flows into Zone 2, then flows into Zone 3 areas (see Appendix B). All uncontainerized processing waste is located in Zone 3 areas. Zone 1 and 2 areas remain clean and accessible to AMWTP facility workers under all normal operation conditions. Access to Zone 3 areas is by radiological work permit only.

The AMWTP facility design also includes features and systems that compartmentalize the facility into separate fire zones that comply with applicable Uniform Building Code and National Fire Protection Association standards. Compartmentalization is provided to create separate fire zones or areas of fire control within the facility, separate thermal treatment equipment rated at over 400,000 Btu/hr from the rest of the facility, and creates a protected means of egress out of the facility in the event of a fire.

The building design provides egress systems per the Life Safety Code (National Fire Protection Association 101), wherein a means of egress is a continuous and unobstructed way of exit travel from any point in the building or structure to an area outside the facility. Means of egress comprising vertical (stairs) and horizontal travel (corridors), including intervening room spaces, are provided through the operator corridors around and through the pretreatment and treatment areas of the facility and stair towers.

The Proposed AMWTP facility would be composed of the following areas: Administrative/Personnel Support Areas; Personnel Access/Security Areas; Offices/Meeting Room Areas; Control Room/Computer Room Areas; Men's/Women's Clean Change Rooms; Backup Monitoring Room; Subchange Rooms; Waste Receiving and Staging Area; Supplies Receiving/Low-Level Waste Loading Area; Pretreatment Areas; Box Line; Drum Line; Box Size Reduction Area; Drum Assay Area; Analytical Laboratory; Drum Staging Area; Central Conveyor Area; Grout Preparation Area; Treatment Areas; Supercompaction/Macroencapsulation Area; Drum Cure Area; Special Case Waste Glovebox; Incineration Area; Thermal Treatment Offgas Systems Area (includes Brine Evaporation); Vitrifier Feed Staging Area; Glass Former Mixing Area; Vitrification Area; Loading Staging Area; Maintenance Areas (Hot and Cold);

and Mechanical/Electrical Support Areas. A detailed discussion of the listed areas can be found in Appendix B.

3.1.2 Advanced Mixed Waste Treatment Project Process Description

The TSA-stored waste designated for treatment at the AMWTP facility would be retrieved, characterized for storage and treatment, stored in preparation for treatment, pretreated, treated, repackaged, and finally, certified and loaded for shipment to WIPP or another appropriate facility. Non-TRU final waste forms would be stored onsite or shipped to a permitted disposal facility when one becomes available. Containers typically would be transported/transferred to, from, and within the AMWTP facility using forklifts, trucks, trucks with trailers, conveyors, hand trucks, and other transport vehicles.

3.1.2.1 Retrieval. The existing Type I and II storage modules make up the Waste Storage Facility (WSF), which is currently permitted for storage under the *Hazardous Waste Management Act* (HWMA) permit, *Final HWMA Storage Permit for the Radioactive Waste Management Complex on the Idaho National Engineering and Environmental Laboratory* (RWMC HWMA Storage Permit). Prior to commencement of AMWTP facility operations, BNFL would take over as operator of a portion of the WSF (and the RWMC HWMA Storage Permit).

Of the approximately 65,000 cubic meters of waste stored at the TSA, approximately 13,000 cubic meters of waste is stored in the Type II modules. A protective structure (the TSA RE) has been constructed over the remaining approximately 52,000 cubic meters of waste, much of which is enclosed by an earthen-covered berm. The TSA RE provides confinement and weather protection for retrieval operations. The location of the Type I and II modules and the TSA RE is shown in Figure 3-1.

3.1.2.2 Preliminary Characterization. Following retrieval of the waste from the TSA RE, waste would initially be characterized in the Type I module. The Type I module would house two real-time radiography (RTR) units, two drum radioassay systems, and a box assay system. Drums and boxes are received at the Type I module from the TSA RE. Waste is unloaded into the Type I module, then the drums and boxes would be placed in interim staging areas awaiting RTR examination, radioassay, and transport to the Type II modules for storage, pending treatment.

Retrieved containers would undergo RTR examination to determine physical waste parameters (e.g., metals, cellulosics, rubber, plastics, soil, sludge) and to detect items that do not meet the WIPP Waste Acceptance Criteria (WAC) (prohibited items such as liquids greater than one percent and elemental mercury). The RTR examination would also provide information about the waste matrix to facilitate the selection of a radioassay technique (passive/active neutron and/or high-resolution gamma scan) and enable radioassay matrix correction factors to be determined. The visual examination of RTR images also validates existing characterization data, or, in the case of unlabeled containers, helps to correlate the contents of the container with known waste types. Details of preliminary characterization activities are described in the AMWTP RCRA Permit Application – Section C.

3.1.2.3 Storage. After preliminary characterization in the Type I module, most of the waste containers would be taken to the Type II modules, where the containers would be grouped by waste category, container type, and fissile material content. The purpose of this staging is to decouple treatment from retrieval and characterization operations and to build up an inventory of waste to facilitate efficient treatment campaigns. Non-debris drums would pass through the Drum Vent Facility in the Type I module for headspace gas venting/sampling and filter installation, prior to routing to the Type II modules for storage. In the Type II modules, the waste containers would be sorted by general waste type and characteristics into treatment campaigns, then transported to the AWMTP facility for treatment.

3.1.2.4 Pretreatment. The waste containers would be transported from the WSF to the waste receiving and staging area, located at the southeast corner of the AMWTP facility. The waste is then transferred within the facility to the pretreatment lines, or directly to treatment processes. The primary pretreatment processes contained within the AMWTP facility to sort and pretreat the waste would include the following:

- A pretreatment box line area where the outer box containers are removed and broken down; and the box contents are removed, size-reduced using a waste feed shredder, and sorted into feed categories for downstream treatment processes; and

- A pretreatment drum line area where facilities are provided to open the drums, identify the waste contents, and sort the waste for feed to the downstream treatment processes.

Each pretreatment line area is equipped with a packet X-ray that may be used to confirm the content of selected items or containers sorted out of the waste to be processed. Following sorting in the box or drum line, waste destined for treatment would be characterized using one or more of the following methods, depending on the treatment to be performed: radioassay; sampling and analysis; proximate analysis; and X-ray fluorescence spectrometry. Certain waste categories are suitable as direct feed for supercompaction and/or macroencapsulation. These drums do not undergo pretreatment, but pass directly to the downstream treatment processes via the central conveyor system. Pretreatment processes are described in greater detail in the AMWTP RCRA Permit Application, Book 2.

3.1.2.5 Treatment. The AMWTP treatment processes are currently being designed to contract specifications: 65 percent volume reduction, treatment to land disposal restrictions (LDR) requirements, and treatment to meet WIPP WAC requirements. The treatment processes that are being proposed at this time are described below. Changes or substitutions to the proposed processes may occur, provided the performance requirements specified in the contract are met. Any substitution or major change of a treatment process will be evaluated to assure that the potential environmental impacts do not exceed those associated with the alternatives analyzed in the Environmental Impact Statement (EIS). The facility and equipment are designed to process up to 85,000 cubic meters of mixed waste in the first 13 years of operation.

Supercompaction. The supercompaction process may receive drums of sorted debris waste from the pretreatment lines or direct feed drums from the waste receiving and staging area via the central conveyor system. The drums of waste would be punctured, then compacted by a hydraulic press that controls the shape of the resultant supercompacted puck through the use of a mold. Under this extreme pressure, gas is vented and processed through the facility air pollution control system. The volume reduction for each drum is dependent on the drum contents and packing fraction but is expected to be an average of 80 percent. The pucks would be placed into a puck drum, which is located in the postcompaction glovebox. The puck drums would then be transferred to the macroencapsulation process. The puck drum would be the final waste form's outermost container.

The supercompactor would be used to efficiently size-reduce 55-gallon drums containing debris mixed waste. It is sized to process the required throughput of approximately 58 drums per day. Drums would be delivered to the supercompactor from two primary sources: the direct-feed line or from the box/drum pretreatment lines. Direct-feed drums (assessed through characterization and RTR analysis as not requiring pretreatment) would be transferred directly to the supercompaction area via the central conveyor system. Waste containers requiring pretreatment would be processed through the box or drum lines first. When appropriately repackaged into 55-gallon drums, these wastes would be transferred via the central conveyor system to the supercompaction area. During the supercompaction process, drums would be managed and compacted within stainless steel gloveboxes. Pucks produced by the process would be staged in the puck staging area of the postcompaction glovebox until they would be loaded into puck drums. A more detailed description of the supercompactor can be found in Appendix B.

Macroencapsulation. Waste is fed into the macroencapsulation process in two forms: containers of pucks and noncompactible debris waste from the pretreatment lines sent directly in mesh baskets within reusable transfer containers via the central conveyor system.

The grout used in the macroencapsulation process is prepared in the adjacent grout preparation area. The grout is piped from the grout preparation area to the postcompaction glovebox, where it is poured into the puck drum, thus stabilizing the noncompactible waste or pucks in the final waste form container. Grouted drums would be lidded and allowed to cure at the drum cure area, located adjacent to the macroencapsulation process area.

The macroencapsulation system would be used to encapsulate pucks or large pieces of metal debris not suitable for compaction. The throughput for the macroencapsulation system is approximately 20 loaded puck drums per day. The system comprises three areas: the grout preparation area, the puck drum grout filling station in the postcompaction glovebox, and the drum cure area. The grout preparation area contains equipment for mixing the grout formulation. The puck drum grout filling station includes two bagless transfer systems for importing puck drums and then loading them with pucks or metal debris (in metal baskets) and grout. The grout filling process is interlocked and controlled to prevent overfilling. When the puck drums are filled with waste and fully encapsulated, they are routed to the drum cure area. The drum cure area can hold up to 28 drums and has a throughput of approximately 24 drums per day. After curing for approximately 24 hours, the final waste form containers will be radioassayed and certified for final disposal at WIPP or another appropriate facility. A more detailed description of the macroencapsulation system can be found in Appendix B and the AMWTP RCRA Permit Application.

Special Case Waste Glovebox. Special case waste is defined in this EIS as those wastes which are not suitable for direct treatment via the primary AMWTP facility supercompaction, macroencapsulation, incineration, and vitrification treatment processes. Special case waste includes wastes which may require additional characterization and/or pretreatment (e.g., neutralization and/or absorption) prior to processing via incineration/vitrification or final treatment (e.g., amalgamation to meet LDRs treatment standards) prior to disposal. Some examples of special case waste are listed below:

- Containers of liquids (i.e., containerized liquids) removed from the original waste containers
- Free liquids (i.e., non-containerized liquids) removed from the original waste containers and containerized prior to transfer to the special case waste glovebox
- Residual liquids accumulated in the sumps and other containment devices in the pretreatment areas and the supercompaction/macroencapsulation area which are removed and containerized prior to transfer to the special case waste glovebox

- Elemental mercury, in the form of containerized liquid, free liquid, or residual liquid, from the areas identified above or from the mercury holding tank, which is removed and containerized, if required, prior to transfer to the special case waste glovebox

- Those waste streams identified as special case waste streams in the AMWTP RCRA Permit Application Table C-1-1 that warrant further evaluation prior to treatment

Containerized, free, and residual liquids and elemental mercury are expected to be the most common types of special case waste transferred to the special case waste glovebox for processing.

Appendix B.1 describes in greater detail the non-thermal treatment processes: supercompaction, macroencapsulation, and special case waste treatment.

Incineration. Incineration is the currently proposed method of thermal treatment and is the technology that is analyzed as being representative of thermal treatment. Wastes destined for incineration would be transferred to and placed into a shredder, located at the head of the incineration process. Approximately 25 percent of the 65,000 cubic meters of waste at INEEL is anticipated to be thermally treated. The shredder would shred the waste and feed it into a waste hopper, where it would be held until it is fed at a controlled rate into the incinerator glovebox feed system. The incinerator as currently proposed is a dual-chamber auger hearth system fired by propane gas. The primary combustion chamber operates at 1,400 to 1,800^{o}F and the secondary chamber at 1,800 to 2,200^{o}F. The incinerator has a feed capacity of 650 lb/hr of solid waste. Both steam reforming and a plasma hearth process are possible alternatives to the proposed auger hearth system. The selected incineration system will be included in the final facility design. Resultant ash from the incinerator would be fed into transfer drums, which are then closed and transported via the centralized conveyor system to the vitrifier feed staging area. Incineration is described in more detail in Appendix B.2.2 of this document. The incineration air pollution control system is discussed in Appendix B.2.3.

Brine Evaporation. The brine evaporator would receive scrubber blowdown liquids generated from the incinerator air pollution control system and potentially contaminated shower water discharged from the decontamination showers in the subchange rooms. The waste streams would collect in a brine mix tank, where they would be mixed with stabilizing agents prior to evaporation. The brine would be evaporated to a dry salt, collected in a container, and transferred out of the AMWTP facility for disposition.

Vitrification. Feed to the vitrification process would be ash from the incinerator. Ash destined for vitrification would be transferred to and placed into a hopper held until fed at a controlled rate into the vitrification unit. A Joule melter is currently considered for the vitrification unit, but a direct current arc melter may also be used in its place. The selected melter will be identified in the final facility design. Glass-forming chemicals would be continuously fed with the ash to enhance the glass quality of the final waste form. The melter and vitrification processes are more completely described in Appendix B.3.1 of this document.

3.2 No Action Alternative

The Council on Environmental Quality (CEQ) *National Environmental Policy Act* (NEPA) Regulations (40 CFR parts 1500–1508) and the DOE NEPA Regulations (10 CFR part 1021) require the analysis of a No Action Alternative. Under the No Action Alternative, existing waste management operations, facilities, and projects would continue for the management of LLMW and TRU waste on the INEEL. Currently, the INEEL stores approximately 65,000 cubic meters of radioactive waste at the RWMC. Of this amount, approximately 40,000 cubic meters is TRU waste and 25,000 cubic meters is alpha LLMW.

Under this No Action Alternative, the Management and Operations (M&O) contractor would continue preparation to ship TRU waste to WIPP using existing facilities. Retrieval of waste from the TSA RE would be initiated and completed with re-storage of the retrieved waste in RCRA compliant storage facilities as described in the *Environmental Assessment: Retrieval and Re-Storage of Transuranic Storage Area Waste at the Idaho National Engineering Laboratory* (TSA EA) (DOE/EA-0692). Shipments to WIPP would continue only as could be supported by existing facilities at the INEEL. The INEEL currently does not have the characterization and repackaging facilities necessary to meet shipment schedules required by current agreements. Waste that could not meet the WIPP WAC would be returned to the storage modules on the RWMC for indefinite storage.

The Waste Experimental Reduction Facility (WERF) would continue to treat both onsite and offsite LLMW that meet the WERF WAC. However, current program plans show WERF closing by 2003, leaving the INEEL with only a small encapsulation unit and an evaporative process for treating LLMW. No new major upgrades or new projects would be undertaken. New activities would be limited to environment, safety, and health activities required to maintain safe operation.

Wastes that could not be sent to WIPP or another waste disposal facility would be stored in the existing INEEL storage facilities indefinitely. The possible environmental impacts of such an approach have been considered in other DOE NEPA documents including the *Waste Isolation Pilot Plant Disposal Phase Final Supplemental Environmental Impact Statement* (SEIS II). The potential impacts of long-term storage of TRU waste at INEEL have been summarized in section 5.21 of this EIS.

The use of this long-term storage approach is not legally permissible as the law currently stands. RCRA does not allow any public or private entity to store untreated hazardous wastes indefinitely; hazardous wastes must be placed into disposal facilities within a very short period of time after they are generated in order to isolate them from the environment. In the case of the waste at the INEEL, isolation from the environment is particularly important because of the “mixed” nature of the waste. Although environmental laws change over time, DOE is of the opinion that any future change in RCRA is not likely to allow storage of these untreated mixed wastes at the INEEL, indefinitely.

Were DOE to continue to store waste, analyses of waste storage for the 100-year period from 2033 to 2133, show that “if DOE continues to provide effective monitoring and maintenance of storage facilities, adverse health effects for the general public would be quite small, and the principal adverse impacts, also small, would be related to occupational activity at the facilities. These health effects would continue at such levels for the indefinite future under the hypothesis of DOE control (DOE 1997d).” In addition, the potential adverse impacts resulting from a storage facility accident would also continue indefinitely.

Over time, the potential for chronic leakage from waste containers and accidents increases. The waste under the No Action Alternative of this EIS is untreated waste, so it contains both hazardous chemicals and unstabilized radioactive waste. The corrosion of the containers may interact with these chemicals, leading to pressure buildup within the containers and a greater likelihood of leakage. Once released, the untreated wastes would pose a greater risk to human health and the environment than the treated, stabilized waste produced in the action alternatives.

If it is assumed that after 100 years of storage "DOE were to lose institutional control of storage facilities, it was estimated that intruders could receive substantial radiation doses, a situation that could persist for the indefinite future. In addition, contaminants in TRU waste stored in shallow trenches and surface storage facilities would eventually be released and would persist in the surrounding environments at the treatment sites exposing onsite and offsite populations to chronic health impacts (DOE 1997d)." If implemented, this alternative would not meet negotiated agreements and commitments (i.e., Settlement Agreement/Consent Order) nor would it meet regulatory requirements under RCRA and the *Toxic Substances Control Act* (TSCA).

3.3 Proposed Action

Under this Alternative, the construction and operation of an AMWTP facility would proceed in accordance with Phases II and III of the project. Construction of the treatment facility would begin at the permitted siting location, in the 1999 construction season. Construction of the treatment facility would be completed no later than December 2002. The facility would begin operation no later than March 2003. The AMWTP facility will treat to WIPP WAC and LDR requirements. Ongoing preparation of the TRU waste for shipment to WIPP by the M&O contractor would continue in support of the milestones identified in the Settlement Agreement/Consent Order. Retrieval of waste from the TSA RE is assumed to begin in calendar year 2001. This early retrieval of waste would be necessary to establish sufficient backlog to campaign each treatment train with sufficient throughput. The facility would have sufficient operating capacity to treat approximately 6,500 cubic meters of waste per year. This alternative accommodates the treatment of 65,000 cubic meters of waste at the INEEL during the initial time frame (by 2015 in accordance with the Settlement Agreement/Consent Order) and treatment of up to 120,000 cubic meters of additional waste from the INEEL or other DOE sites by 2033 for a total of 185,000 cubic meters. Only DOE waste that meets the AMWTP WAC, and non-INEEL waste that satisfies the STP consent order for receipt and treatment, can be accepted.

3.4 Non-Thermal Treatment Alternative

Under the Non-Thermal Treatment Alternative, some treatment of LLMW, alpha LLMW, and TRU waste would still occur. Wastes such as PCBs which require thermal treatment and other waste destined for thermal treatment (e.g., waste with high volatile organic compound [VOC] content) to meet disposal criteria would be repackaged for storage. The AMWTP facility would be built at the same proposed location and operated using the treatment options of supercompaction and macroencapsulation. Facility construction would begin as identified in the Proposed Action. Completion of the facility would still occur by December 2002. The Non-Thermal facility size and layout would be the same as described in the Proposed Action. The facility would differ from the Proposed Action in that the thermal treatment processes and corresponding supporting equipment would not be installed. Areas of the facility that were described in the AMWTP to be used for thermal treatment would be reserved for the installation of another drum or box line or for additional treatment processes that may be required in the future. This facility would still receive retrieved waste from the TSA RE, newly generated INEEL waste, and possible offsite waste from other DOE sites. The facility would characterize, treat, and repackage for storage and/or disposal LLMW, alpha LLMW, and TRU waste. This facility would characterize waste the same as described for the Proposed Action; some waste drums would then proceed directly to supercompaction for treatment. The remainder of the waste drums and all of the waste boxes would be opened and the waste sorted, sized, and repackaged. The repackaged waste would be either treated using supercompaction and/or macroencapsulation or be placed into the Type II storage modules until the waste could be disposed of at a disposal facility (other than WIPP), or until other appropriate treatments become available. Through characterization and sorting, the maximum amount of waste possible, estimated to be 55,000 of the 65,000 cubic meters of waste under current WIPP WAC requirements, would be prepared for shipment to a geological repository such as WIPP. Operation of the facility would continue until 2015 at which time it is anticipated that the need for such a facility would no longer exist. Treatment of non-INEEL waste in this facility is anticipated to be minimal if any. If implemented, this alternative would not meet negotiated agreements (i.e., Settlement Agreement/Consent Order) and commitments nor would it meet regulatory requirements under RCRA and TSCA.

3.5 Treatment and Storage Alternative

Under the Treatment and Storage Alternative, the treatment facility described under Section 3.3 would be built in the same location, contain the same treatment processes, and result in the same waste forms. The difference between this alternative and the Proposed Action is that in the Treatment and Storage Alternative, the treated waste would not be shipped to an offsite disposal repository but, instead, would be placed into storage on the INEEL at the RWMC. This alternative is being evaluated as a contingency in the event WIPP is unable to receive and dispose of INEEL waste. Long-term storage impacts were previously analyzed in the WM PEIS and SEIS-II. A discussion of the potential environmental impacts resulting from long-term storage is provided in Section 5.21, Long-Term Storage Impacts. The long-term storage impacts at the INEEL have been tiered from the SEIS-II. The potential environmental impacts associated with the treatment facility is the same as the Proposed Action.

The wastes would be treated to RCRA LDRs, packaged for disposal, and then returned to the RCRA-compliant Type II storage modules located at the RWMC. Currently, there are seven RCRA-compliant Type II Storage modules within the RWMC. To be able to campaign waste for treatment and also store the treated waste, it is assumed for analysis purposes that possibly three additional Type II modules would be built. The modules to be built would be located inside the existing RWMC fence in the vicinity of the existing storage. The new storage facilities would be built and operated to the same standards as the existing storage modules. The ten storage modules would only allow for the storage (after treatment) of the 65,000 cubic meters of waste that currently exists in the TSA RE. For the AMWTP facility to treat other INEEL-generated wastes, additional storage facilities would need to be built or made available, and an acceptable facility location would need to be identified for the new storage facilities.

Wastes from other DOE sites could still come to the AMWTP facility for treatment. As in the Proposed Action, such off site wastes would only come to the AMWTP facility for treatment with the approval of the State of Idaho, and the treated waste would be returned to the waste generating facility or sent to an approved disposal facility. The transportation of these wastes if not covered by existing NEPA documentation would be subject to further NEPA review before implementation. Implementation of this alternative would not meet negotiated agreements and commitments (i.e., Settlement Agreement/Consent Order) nor would it conform to existing program decisions to dispose of TRU wastes (WM TRU Record of Decision [ROD] and WIPP ROD [63 FR 3624]).

3.6 Alternatives Considered But Not Analyzed

The following alternatives were considered in the selection process described in Section 3.6.1 or in the process of identifying the Proposed Action, but were found not to be reasonable because: they were technically infeasible; were not capable of processing the existing waste types; or were not available on the schedule necessary to accommodate DOE's agreement with the State of Idaho. Alternatives found to be unreasonable were not analyzed in detail in this document.

Treatment of the INEEL Waste at a Privatized Facility in Richland, Washington. Under this alternative, DOE-ID would send to a privatized facility the waste that would meet the WAC for that facility. DOE-ID would still need to build a facility or facilities to characterize, sort, segregate and repackage waste to meet U.S. Department of Transportation (DOT) rules for shipment to Richland. Waste that could not go to Richland (i.e., the 40,000 cubic meters of TRU plus arsenic, asbestos, and beryllium contaminated materials), after separation and segregation, would still need to be treated and repackaged to meet the WIPP WAC for disposal. DOE-ID would also need to build additional TRUPACT-II loading facilities under this scenario.

Considering that a large percent of the INEEL wastes do not meet the Richland, WA treatment facility's WAC and the facility cannot handle the additional INEEL volume (the permitted capacity is planned to be 2,400 cubic meters per year, which would be overwhelmed by this volume increase since INEEL alone needs to treat a minimum of 5,000 cubic meters per year) this alternative is not considered reasonable.

Siting AMWTP at Another INEEL Location. Other locations for the AMWTP at the INEEL were considered but dismissed because the location of the AMWTP at the RWMC would avoid movement of retrieved waste across public roads. Alternative sites were formally reviewed in support of the *Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Environmental Impact Statement* (DOE INEL EIS) and as part of the siting license requirements for the AMWTP facility (Monson 1997). For analytical purposes, the DOE INEL EIS analyzed the potential impacts of a treatment facility at a "greenfield" undisturbed site approximately 2.5 miles east of the RWMC. However, that site was not selected for this facility.

Ship to Other DOE Facilities for Treatment. The use of other existing DOE thermal treatment facilities such as the Consolidated Incineration Facility and M-Area Vitrification Facility at Savannah River Site, the Remote Handled TRU Treatment Facility (in design) in Oak Ridge, and the TSCA incinerator at Oak Ridge Reservation were also considered but eliminated from detailed study. Based on the amount of onsite waste needing processing at these sites prior to accepting offsite (e.g., INEEL) wastes, the restrictive WAC, and the limited throughput of these facilities, the schedule required for the INEEL program would not be met. In addition, DOE considered shipping untreated waste to the WIPP for treatment and disposal. This was not considered further because it would require changing legally binding orders and agreements stipulated in the Settlement Agreement and the INEEL Site Treatment Plan under the *Federal Facility Compliance Act*. The SEIS-II Action Alternative 2C included analysis that assumed CH-TRU waste would be treated at WIPP; however, this alternative was not selected in the SEIS-II ROD.

Chop and Grout Alternative. This alternative is a form of macroencapsulation. As a primary process, waste containing PCBs, mercury, and semivolatile and volatile chemicals would not meet disposal requirements, or LDR requirements, using a chop and grout process. Waste to be processed in the Proposed Action would be handled by the chop and grout process as part of supercompaction and macroencapsulation. The potential environmental impacts associated with chop and grout would be similar to, or potentially greater than, those associated with the proposed supercompaction and macroencapsulation. Chop and grout would not result in the desired volume reduction and would in fact result in an increased waste volume.

In addition, a chop and grout treatment by itself is not a reasonable alternative due to the various physical waste types that may exist in the waste to be treated. Experience has shown that with these heterogenerous types of waste, the use of a chop and grout process can result in increased equipment down time and as a result additional maintenance worker exposure. Therefore, this alternative has not been considered as a primary treatment alternative.

Chemical Processing. Chemical processing refers to any process that removes or changes an unwanted characteristic of the waste using a discrete chemical reaction. Chemical processing may refer to several different types of reactions ranging from neutralization of acids and bases, selective oxidation and reduction reactions, to amalgamation of mercury, or many other reactions. Chemical processing tends to be very specific, not applicable to broad categories of waste and tends to produce reaction products, which may also be very difficult to control and dispose. Although BNFL is planning to use chemical processing in the proposed AMWTP for very small volume waste streams, including mercury amalgamation and neutralization, it is not a reasonable primary treatment alternative.

Biological Processing. As the name implies, biological processing is the use of living organisms to induce reactions, that remove or stabilize a toxic characteristic of the waste. Biological processes are most applicable to dispersed hydrocarbon contamination and posses a limited ability to stabilize some metals. Because the waste designated for treatment in the AMWTP have low concentrations of these constituents, biological processing is not feasible or reasonable.

Other Thermal Treatment Processes. DOE has completed numerous assessments of thermal treatment technologies. Several studies have identified potential thermal treatment technologies that are under consideration. The DOE Publication, *Report of the Technical Peer Review of Thermal Treatment Technologies for TRU, TRU Mixed, and Mixed Low-Level Wastes*, November 1995, assessed the current status and stage of development of non-incineration thermal treatment systems "to identify technically matured technologies." The Peer Review Panel identified several non-incineration thermal treatment technologies as having "reached a development maturity sufficient enough to begin commercial operation," but also identified "a number of cross-cutting technical issues that represent some risk for commercial operation and apply more or less to all thermal treatment technologies under development by DOE." Also, the *Savannah River Site Waste Management Final Environmental Impact Statement* (DOE/EIS-0217, 1995) evaluated both existing and emerging waste treatment technologies for alpha and non-alpha LLMW. Appendix D of the Savannah River Site EIS provided a summary of conventional and emerging treatment technologies that were considered or considered and then rejected from further consideration. Approximately 30 emerging treatment technologies for LLMW treatment were considered based on criteria of availability and proven technology. Two of the 30, vitrification and plasma furnace, were described as being "available" and only vitrification was described as a "proven technology" and then only for treatment of high-level waste. The remaining 28 technologies were considered not reasonable as proposed alternatives when evaluated against the available and proven technology criteria used by the Peer Review Panel.

The following is a discussion of several technically feasible thermal treatment technologies that were potentially applicable to the AMWTP facility.

Steam Reforming. Steam reforming has received attention due to its perceived ability to be permitted as a non-incineration process. Steam reforming is a process by which very hot steam (700°C) is reacted with hydrocarbon materials to produce hydrogen and carbon monoxide. The process has low rates of reaction and thus requires quite long residence times in the hot reaction zone. Although steam reforming has technical merit, and the environmental impacts were found to be equivalent to those of incineration, the process is limited to processing only incinerable waste without heavy metals, and has not been proven capable of treating PCBs or other potentially harmful volatile and semi-volatile chemicals found in the INEEL alpha LLMW and TRU waste streams. Therefore, it is not analyzed as a separate alternative in this document, but remains a reasonable thermal treatment process whose potential environmental impacts are comparable to those associated with incineration.

Fixed and Rotating Plasma Hearth Processes. Plasma processes are based upon electrically ionizing a gas into highly charged plasma. The plasma is then directed at the waste. The waste is heated by absorbing energy directly from the plasma and by resistive current flow. Plasma processes are characterized by their very high point source temperatures (several thousands of degrees). Plasma heating has been used in two primary configurations. The first is a fixed hearth in which the waste to be melted is in a fixed tub with the plasma torch being gimbaled over the waste creating a molten pool. The second is a rotating hearth in which the waste is added to a rotating tub which moves the waste under the plasma torch. When waste has been melted, the rotation is slowed, allowing the waste to exit via a central hub drain. Both configurations have high melt temperatures and are advertised as being able to process a wide range of waste types. Plasma melters have had little testing on actual radioactive waste. Although the environmental impacts associated with plasma melters were found to be equivalent to incineration, operational experience is limited, the process has not been tested on radioactive waste, and further developmental work would be required before this alternative can be proven to be a viable commercial option for INEEL mixed TRU and alpha waste streams. Therefore, it is not analyzed as a separate alternative in this document.

Direct Current and Alternating Current Arc Melters. Direct current and alternating current arc melters operate by creating an electrical arc and resistive current path through the waste, causing it to melt. In the direct current melter, the current path is between a central electrode and an outer conductive hearth. In the alternating current melter, the current path is between three electrodes that are at different electrical potentials. The electrodes are made of high-purity carbon. Both direct current and alternating current arc melters have been extensively used in the recycled steel industry for many decades. Arc melters produce high temperature melts, much like plasma melters, and have been advertised as being applicable to a broad variety of waste types. Direct current and alternating current arc melters have been tested on surrogate radioactive waste. Little testing has been conducted on actual radioactive waste; therefore, based on the lack of production scale radioactive waste processing experience, this is not a reasonable alternative.

Molten Metal. This technology employs the use of a molten bath of iron or nickel. The waste to be processed is ground up into fine particles and injected into the bottom of the metal bath. Liquid or gas waste may also be injected into the metal bath. The highly reducing characteristics of the metal bath decompose hazardous hydrocarbons to hydrogen and carbon monoxide. Elemental metals are incorporated into the metal bath. Metal oxides, which are not soluble in the metal phase, form a slag layer on top of the bath. Testing done thus far has indicated that molten metal technology does not easily process highly heterogeneous materials, requires a secondary combustion system to oxidize hydrogen and carbon monoxide, may cause excessive corrosion of the refractory at the slag-metal interface and may produce highly reduced metal particles in the off-gas treatment system which may self-heat when exposed to oxygen. Therefore, due to the technical limitations and the additional emission control features required to use this process, this is not a reasonable alternative.

Joule-Heated Melter. Joule melters operate by passing a current between two electrodes. The current passes directly through the waste, heating it resistively very much like an electric stove burner. Joule melters have been used for many years in the glass making industry. Because Joule melters rely to a very high degree on the electrical characteristics of the waste and glass forming additives they are not suitable for treating highly heterogeneous waste materials. It should be noted the 65,000 cubic meters of waste at the INEEL are very heterogeneous, therefore this process cannot be considered as a primary treatment for all INEEL waste. Joule melters are currently being used to produce high-level radioactive waste glass at the Savannah River Site and West Valley, New York, and are proposed for use at the Hanford Site. A Joule melter is contained within the BNFL process flow sheet for treatment of incinerator ash in the AMWTP. This technology is being analyzed as part of thermal treatment but, because it cannot be used to process all waste types, this is not a reasonable primary thermal treatment process.

Molten Salt Oxidation. The molten salt process employs a bath of magnesium carbonate into which selected waste is injected. Hazardous hydrocarbons are oxidized to water and carbon dioxide. Halogens such as chlorine are retained within the bath as magnesium chloride. Solids added to the bath either remain as a separate solid phase or are dissolved in the melt at high temperature. Molten salt oxidation is most suitable for the oxidation of liquid hydrocarbons under conditions in which permitting of a traditional incinerator may not be possible. Most solids and some liquids that have ash-forming ability tend to raise the melting point of the magnesium carbonate. This rise in bath melting point may cause it to solidify during operation. Because of this, the feed to the molten salt oxidation process must be carefully controlled. Because of these process technical concerns, this process was dropped from future consideration.

3.6.1 Advanced Mixed Waste Treatment Project Technology Selection Process

DOE has been storing TRU waste at the INEEL since the early 1980s. In the early 1990s, DOE considered plans to retrieve 65,000 cubic meters of stored waste from the earthen-covered berm, segregate the alpha LLMW from the TRU waste, and build and operate a treatment facility. Alpha LLMW would be treated to comply with RCRA LDR requirements and the TRU waste would be treated to meet the WIPP WAC. Additional RCRA storage modules were also planned for the retrieved and/or treated waste.

In 1992 and 1993 DOE requested studies to examine the potential for private sector treatment of alpha LLMW. These studies concluded that cost savings could be achieved, and the schedule shortened by 7 years, if waste treatment were privatized. As a result, DOE issued a Scope of Work for a “Feasibility Study of Treatment Services for Alpha-Contaminated Mixed Low Level Waste.” Three private sector teams provided feasibility studies. After extensive evaluation by DOE, a decision was made to pursue the procurement of treatment, assay, and characterization services for alpha LLMW and TRU waste from the private sector. At the same time, information from the feasibility studies was provided for analysis in the DOE INEL EIS. In the ROD for the DOE INEL EIS, DOE decided that the INEEL would construct treatment facilities necessary to comply with the FFCAct. DOE also decided to treat the waste to meet the WIPP WAC at a minimum; this treatment will occur on a schedule to be negotiated with the State of Idaho.

In 1996, a final request for proposal for treatment of alpha LLMW and TRU was issued. Bids were received from four teams, three of which were determined to be in the competitive range. DOE performed an extensive evaluation of the competitive bids, including a comparative evaluation of the potential environmental impacts of each proposal. This evaluation was performed in accordance with Section 216 of the DOE NEPA regulations, and included a confidential environmental critique, the results of which are summarized in an Environmental Synopsis (DOE 1998e) that is available to the public. Based on the Synopsis, a summary of the environmental comparison of the different technologies proposed by the three offerors for the AMWTP is presented in Table 3.6-1. In December 1996, DOE awarded a three-phase contract for a treatment facility to one of the three offerors, BNFL. Phase I of the contract addresses permitting, NEPA review, and an environmental, safety, and health authorization process, including the completion of this EIS. Before deciding whether to proceed with construction (Phase II), DOE must complete this EIS. If, after completing this EIS, DOE decides not to move forward with Phase II (construction) and Phase III (operation) of the project, the contract will be terminated.

Table 3.6-1. Environmental Comparison of Contractor Proposed AMWTP Technologies.

	Baseline from DOE INEL EIS	Technology A	Technology B	Technology C
Land Use	200 acres of previously undisturbed land would be impacted. Facility to be located outside of the RWMC 2.5 miles to the east.	Less than 10 acres of previously disturbed land within the existing RWMC fence.	Approximately 5 acres of previously disturbed land would be potentially impacted.	40 acres of previously undisturbed land would be used. No conflict with existing land use plans is anticipated.
Historic/Cultural Resources	Unknown number of historic/cultural sites would be impacted - Surveys would be conducted and recorded. Mitigation necessary under applicable requirements would occur.	No impact anticipated. No known resources/site exist within the proposed RWMC location.	Facility to be located within an existing use area. No known resources/sites would be impacted.	Unknown number of sites may be impacted. Surveys would be conducted and recorded. Mitigation necessary under applicable requirements would occur.
Wetland, Wildlife, and Habitat	Loss of biodiversity and habitat productivity would occur. Animal displacement and mortality may occur. The potential for habitat fragmentation exists.	In that this is a previously disturbed area, no new impacts are expected.	In that this is a previously disturbed area, no new impacts are expected.	Potential exists as described in the baseline, however impacts would be less than the baseline in that only 40 acres would be disturbed as compared to 200 acres.
Flood Plain	Proposed site is not located within the 100/500 year floodplain	Proposed site is not within the probable maximum flood area. The existing flood diversion system at the RWMC would protect from localized (run-on, run-off) flooding.	Flood diversion system in place to protect facilities. Existing information indicates the existing dikes, culverts, and stream channels at the RWMC would withstand potential floods.	Proposed location is above the 10,000 year flood plain.
Geology and Seismicity	Potential seismic and volcanic hazards exist. Seismic hazards include ground shaking and surface deformation. Effects of lava flows include ground deformation, volcanic	Potential for future seismic and volcanic activity exists - new facilities will be constructed to applicable codes and regulations.	Facility located near the NW margin of the Eastern Snake River Plain that experienced abundant volcanism. The INEL is not within the active seismic zone of the	Site chosen consists mainly of basaltic rock overlain by a thin layer of soil. The site is located one mile or more from a capable fault and is not located in an area subject

Table 3.6-1. Environmental Comparison of Contractor Proposed AMWTP Technologies.

	Baseline from DOE INEL EIS	Technology A	Technology B	Technology C
	earthquakes and ash flows or airborne ash deposits.		intermountain seismic belt. The INEL is a seismic zone 2B of Uniform Building Code.	to volcanic fissuring.
Water and Water Quality	Water use - construction - no information provided. Operation - 20 million liters/year. Effluent - no discharges from normal operations. Some effluent would result from construction.	Water use - some water to be used during construction. Water use during operations would consist primarily of process cooling water and sanitary water. Effluents would result from construction. There will be no discharges from normal operations.	Water use - approximately 180gals/min needed for operation. Effluents - no impacts to ground water identified.	No processing effluent, all processing water to be recycled. Water use requirements would be within the INEL permitted capacity.
Air	See Belanger Et al, 1995 for details. The following values are maximum potential impacts taken from both the IWPF project summary and the alpha LLMW project summary. Radiological - 0.046% of the NESHAP limit for alpha LLMW and 4.2% of the NESHAP limit for TRU waste. For toxic air pollutants, 86% of the significant level for combined toxic air pollutants. 68% of the significant level for lead. 60% of the significant level for mercury. For prevention of significant deterioration 34% of the 3hr limit for sulfur dioxide impact on the class I area, Craters of the Moon. Control	Waste Stream characteristics and anticipated processing throughputs are consistent with the facilities analyzed in the DOE INEL EIS, indicating similar potential impacts. More detailed potential impacts from both construction and operation will be calculated using design and process data that will be available once detailed design can start. Based on conceptual design information impacts are anticipated to be less than those analyzed in the DOE INEL EIS.	Conservative modeling using previously developed emission sources and emission estimates per pollutant indicated that no Clean Air Act significant emission rate threshold would be exceeded. Direct impacts to air quality from treatment are not expected. Offgases produced as part of routine operations are not anticipated to exceed applicable air standards. Engine exhaust and vehicle traffic dust are the only expected sources of air pollution.	Based on the conceptual design impacts from the proposed treatment facility are less than those analyzed in the DOE-EIS. Final determination will be made during the Phase I design and permitting process. The proposed treatment approach is not expected to impact air quality. No visual impairment to a Class I area is expected. Minor impacts on visibility due to construction may occur as a result of fugitive particulate emissions.

Table 3.6-1. Environmental Comparison of Contractor Proposed AMWTP Technologies.

	Baseline from DOE INEL EIS	Technology A	Technology B	Technology C
	measures may be needed to mitigate visibility impacts.			
Health and Safety	Health effects would vary over the life of the project based on the treatment schedule. Radiation exposure and cancer risk to the maximally exposed individual, 0.42 mrem/yr with a risk factor of 2.1×10^{-7} latent cancer fatalities/year. Potential maximum dose to the effected population was calculated to be 1.6 person-rem or 8.0×10^{-4} latent cancer fatalities/yr. Non-Radiological exposure - negligible impact on health effects is expected.	Conservative basis for the DOE INEL EIS analysis indicated lower impacts for the proposed facility can be expected. Potential impacts will be recalculated based on Phase I design information. Plants have been designed and built to minimize worker exposure. The average worker dose will not exceed 500 mrem/yr.	Operational exposures will be maintained at less than 500 mrem/yr. No foreseeable health and safety impacts are expected from normal operations. Hazard Index during operation for the worker is 0.0001 and for the public is 0.03. Non-radiological cancer risk (per person) would be less than 3.0×10^{-10} for workers and 2.0×10^{-9} to the public. The Radiological Cancer risk (per person) is estimated to be less than 1.2×10^{-7} for the worker and 6.8×10^{-8} to the public.	Safety and dose mitigating factors will be incorporated in the design and construction of the facility. Radiological and non-radiological impacts are expected to be less than the potential impacts for the proposed facilities in the DOE-EIS. Potential impacts will be calculated during the Phase I facility design.

3.7 Preferred Alternative

The Preferred Alternative is the alternative that DOE believes would best fulfill its statutory mission, giving consideration to environmental, economic, technical, and other factors. DOE has identified the Proposed Action (i.e., the construction and operation of the AMWTP facility described in Section 3.3) as the preferred alternative based on information developed so far (e.g., environmental impacts from the DOE INEL EIS, feasibility studies, NEPA 216 process, and procurement process).

The ROD issued after the Final EIS will describe DOE's decision regarding whether to allow BNFL to proceed with the construction and operation of the AMWTP facility.

3.8 Comparison of Impacts

This section compares the potential environmental impacts of implementing each of the four alternatives described in Sections 3.2 through 3.5. This brief comparison of impacts is presented to aid the decisionmakers and the public in understanding the environmental impacts of proceeding with each of the alternatives at the INEEL.

The following discussion is based on the detailed information presented in Chapter 5, Environmental Impacts. The environmental impact analyses are designed to produce a credible projection of the bounding potential environmental impacts, utilizing conservative assumptions and analytical approaches. A detailed discussion of the level of conservatism and degree of uncertainty in these analyses is presented in Chapter 5. Table 3.8-1 summarizes the potential impacts of each alternative for the various environmental subject areas and lists proposed measures that could mitigate these impacts.

Table 3.8-1. Summary Comparison of Alternative Environmental Impacts (In Addition to Baseline).

Discipline	No Action Alternative	Proposed Action	Non-Thermal Treatment Alternative	Treatment and Storage Alternative
Land Use	No new land disturbance would occur at the RWMC or INEEL.	Disturb approximately 7 acres of previously disturbed land within and adjacent to the RWMC for project construction activities.	Disturb approximately 7 acres of previously disturbed land within and adjacent to the RWMC for project construction activities.	Disturb approximately 7 acres of previously disturbed land within and adjacent to the RWMC for project construction activities.
	Existing and planned land uses within the RWMC and other INEEL facilities would not change.	No effects on surrounding land uses or local land use plans or policies are expected.	No effects on surrounding land uses or local land use plans or policies are expected.	No effects on surrounding land uses or local land use plans or policies are expected.
	Mitigation: None anticipated.	Mitigation: None anticipated.	Mitigation: None anticipated.	Mitigation: None anticipated.
Socio-economics	No increase in new employment or workers would be expected. The employment and population in the region of influence (ROI) would remain the same.	Construction would generate a total of 254 jobs (125 direct and 129 indirect) in the ROI during the peak year, an increase of less than 1 percent in ROI employment.	Construction would generate a total of 254 jobs (125 direct and 129 indirect) in the ROI during the peak year, an increase of less than 1 percent in ROI employment.	Construction would generate a total of 254 jobs (125 direct and 129 indirect) in the ROI during the peak year, an increase of less than 1 percent in ROI employment.
		Operation would require 146 workers and would generate 406 jobs (146 direct and 260 indirect) in the ROI. There would likely be no change to the level of community services provided in the ROI.	Operation would require 133 workers and would generate 369 jobs (133 direct and 236 indirect) in the ROI. There would likely be no change to the level of community services provided in the ROI.	Operation would require 146 workers and would generate 406 jobs (146 direct and 260 indirect) in the ROI. There would likely be no change to the level of community services provided in the ROI.
	Mitigation: None anticipated.	Mitigation: None anticipated.	Mitigation: None anticipated.	Mitigation: None anticipated.
Cultural Resources	Impacts to cultural resources at the RWMC are not expected.	Implementation of the Proposed Action would result in impacts to cultural resources that appear negligible, although a potential for subsurface discoveries exists.	Implementation of the Non-Thermal Treatment Alternative would result in impacts to cultural resources that appear negligible, although a potential	Implementation of the Treatment and Storage Alternative would result in impacts to cultural resources that appear negligible, although a potential for

Table 3.8-1. Summary Comparison of Alternative Environmental Impacts (In Addition to Baseline).

Discipline	No Action Alternative	Proposed Action	Non-Thermal Treatment Alternative	Treatment and Storage Alternative
			for subsurface discoveries exists.	subsurface discoveries exists.
Cultural Resources (continued)		The optional 0.5-acre lagoon expansion would potentially impact a known archaeological site; however, testing has indicated that the site is likely not eligible for nomination to the National Register of Historic Places (NRHP).	The optional 0.5-acre lagoon expansion would potentially impact a known archaeological site; however, testing has indicated that the site is likely not eligible for nomination to the NRHP.	The optional 0.5-acre lagoon expansion would potentially impact a known archaeological site; however, testing has indicated that the site is likely not eligible for nomination to the NRHP.
		Construction of the new 138-kV power line to support the proposed AMWTP facility would not impact any known archaeological sites.	Construction of the new 138-kV power line to support the proposed AMWTP facility would not impact any known archaeological sites.	Construction of the new 138-kV power line to support the proposed AMWTP facility would not impact any known archaeological sites.
	Mitigation: None anticipated	Mitigation: A strong stop work order is in effect at the INEEL in the event that any cultural resources or human remains are discovered during construction for this project. The INEEL Cultural Resources Management Office, the State Historic Preservation Officer (SHPO), and Native American tribes would be immediately notified for consultation if any cultural resources or human remains are discovered during excavation.	Mitigation: A strong stop work order is in effect at the INEEL in the event that any cultural resources or human remains are discovered during construction for this project. The INEEL Cultural Resources Management Office, the SHPO, and Native American tribes would be immediately notified for consultation if any cultural resources or human remains are discovered during excavation.	Mitigation: A strong stop work order is in effect at the INEEL in the event that any cultural resources or human remains are discovered during construction for this project. The INEEL Cultural Resources Management Office, the SHPO, and Native American tribes would be immediately notified for consultation if any cultural resources or human remains are discovered during excavation.
Aesthetic and Scenic Resources	The existing INEEL visual setting would not change, nor would area scenic resources be	The AMWTP would not change the visual setting or affect aesthetic resources of the area.	The AMWTP would not change the visual setting or affect aesthetic resources of the area.	The AMWTP would not change the visual setting or affect aesthetic resources of the area.

Table 3.8-1. Summary Comparison of Alternative Environmental Impacts (In Addition to Baseline).

Discipline	No Action Alternative	Proposed Action	Non-Thermal Treatment Alternative	Treatment and Storage Alternative
	affected.			
Aesthetic and Scenic Resources (continued)	Mitigation: None anticipated.	Mitigation: None anticipated.	Mitigation: None anticipated.	Mitigation: None anticipated.
Geology	Minor impacts on the geology and geologic resources of the INEEL due to extracting aggregate, clay, sand, and soil from gravel and borrow pits at the INEEL to support existing and ongoing waste management road maintenance, environmental restoration, and other site construction activities.	Minor adverse impacts on the geology and geologic resources of the INEEL due to disturbances associated with construction, parking, and construction laydown areas. Excavation for the proposed AMWTP building foundation and electric substation would amount to approximately 16,000 cubic yards of material.	Minor adverse impacts on the geology and geologic resources of the INEEL due to disturbances associated with construction, parking, and construction laydown areas. Excavation for the proposed AMWTP building foundation and electric substation would amount to approximately 16,000 cubic yards of material.	Minor adverse impacts on the geology and geologic resources of the INEEL due to disturbances associated with construction, parking, and construction laydown areas. Excavation for the proposed AMWTP building foundation and electric substation would amount to approximately 16,000 cubic yards of material.
		If needed, the 0.5-acre sewage lagoon expansion would require excavation of an additional 1,033 cubic yards of soil.	If needed, the 0.5-acre sewage lagoon expansion would require excavation of an additional 1,033 cubic yards of soil.	If needed, the 0.5-acre sewage lagoon expansion would require excavation of an additional 1,033 cubic yards of soil.
		Construction of the AMWTP facility would require the extraction of approximately 20,000 cubic yards of aggregate, clay, and sand from INEEL borrow areas.	Construction of the AMWTP facility would require the extraction of approximately 20,000 cubic yards of aggregate, clay, and sand from INEEL borrow areas.	Construction of the AMWTP facility would require the extraction of approximately 20,000 cubic yards of aggregate, clay, and sand from INEEL borrow areas.
	Mitigation: Runoff controls, dust controls, and reuse of stockpiled soil.	Mitigation: Runoff controls, dust controls, and reuse of stockpiled soil.	Mitigation: Runoff controls, dust controls, and reuse of stockpiled soil.	Mitigation: Runoff controls, dust controls, and reuse of stockpile soil.

Table 3.8-1. Summary Comparison of Alternative Environmental Impacts (In Addition to Baseline).

Discipline	No Action Alternative	Proposed Action	Non-Thermal Treatment Alternative	Treatment and Storage Alternative
Air Resources	*Radiological Impacts:* (Radiation dose in millirem/yr.) Onsite Worker: 0.023 MEI Offsite: 0.11 Population: 0.41	*Radiological Impacts:* (Radiation dose in millirem/yr.) Onsite Worker: 0.73 MEI Offsite: 0.11 Population: 0.056	*Radiological Impacts:* (Radiation dose in millirem/yr.) Onsite Worker: 0.003 MEI Offsite: 0.0017 Population: 0.00037	*Radiological Impacts:* (Radiation dose in millirem/yr.) Onsite Worker: 0.73 MEI Offsite: 0.11 Population: 0.056
	Non-Radiological Impacts:	*Non-Radiological Impacts:*	*Non-Radiological Impacts:*	*Non-Radiological Impacts:*
	Criteria pollutant and toxic pollutant levels well within applicable standards.	Projected criteria pollutant emission levels less than 1 percent of applicable standards.	Projected criteria pollutant emission levels less than 1 percent of applicable standards.	Projected criteria pollutant emission levels less than 1 percent of applicable standards.
		Projected incremental emission levels of all carcinogenic substances would be less than 1 percent of applicable standards.	Projected incremental emission levels of all carcinogenic substances would be less than 0.1 percent of applicable standards.	Projected incremental emission levels of all carcinogenic substances would be less than 1 percent of applicable standards.
		All noncarcinogenic emission levels would be less than 1 percent of applicable standards except for selenium, which would be about 1 percent of the standard.	All noncarcinogenic emission levels would be less than 0.001 percent of applicable standards.	All noncarcinogenic emission levels would be less than 1 percent of applicable standards except for selenium, which would be about 1 percent of the standard.
	Mitigation: None anticipated.	Mitigation: None anticipated.	Mitigation: None anticipated.	Mitigation: None anticipated.
Water Resources	No discharges of hazardous or radioactive waste to the vadose zone would be expected to occur in the near-term (2133). In the	No direct discharges of hazardous or radioactive waste would occur.	No direct discharges of hazardous or radioactive waste would occur.	No direct discharges of hazardous or radioactive waste would occur.

Table 3.8-1. Summary Comparison of Alternative Environmental Impacts (In Addition to Baseline).

Discipline	No Action Alternative	Proposed Action	Non-Thermal Treatment Alternative	Treatment and Storage Alternative
Water Resources (continued)	long-term, the potential for chronic leakage and contamination of the vadose zone would increase.			
	No discharges to surface water. Potential minor impacts would result from potential future sources of contamination compared with sources from previous waste management practices at the INEEL.	No direct discharges to surface water.	No direct discharges to surface water.	No direct discharges to surface water.
	The consumption of 1.9 billion gallons per year of water from the Snake River Plain Aquifer would continue.	Increase in water consumption by 2.7 million gallons per year.	Increase in water consumption of less than 2.7 million gallons per year.	Increase in water consumption by 2.7 million gallons per year.
	Mitigation: None anticipated.	Mitigation: None anticipated beyond project design and administrative controls.	Mitigation: None anticipated beyond project design and administrative controls.	Mitigation: None anticipated beyond project design and administrative controls.
Ecology	The potential to affect Federal-listed plant and animal species, or species identified by other Federal and/or State agencies is not likely. No activities that could potentially affect wetlands and surface waters would be expected.	No impact to Federal- or State-listed protected, sensitive, rare, or unique species expected. If constructed, the 0.5-acre sewage lagoon expansion would have a small beneficial effect on some wildlife species with access to the lagoon.	No impact to Federal- or State-listed protected, sensitive, rare, or unique species expected. If constructed, the 0.5-acre sewage lagoon expansion would have a small beneficial effect on some wildlife species with access to the lagoon.	No impact to Federal- or State-listed protected, sensitive, rare, or unique species expected. If constructed, the 0.5-acre sewage lagoon expansion would have a small beneficial effect on some wildlife species with access to the lagoon.

Table 3.8-1. Summary Comparison of Alternative Environmental Impacts (In Addition to Baseline).

Discipline	No Action Alternative	Proposed Action	Non-Thermal Treatment Alternative	Treatment and Storage Alternative
Ecology (continued)		Potential radiological exposure to plant and animal species within the RWMC and adjacent surrounding area are not expected to significantly affect biotic populations and communities in the area.	Potential radiological exposure to plant and animal species within the RWMC and adjacent surrounding area are not expected to significantly affect biotic populations and communities in the area.	Potential radiological exposure to plant and animal species within the RWMC and adjacent surrounding area are not expected to significantly affect biotic populations and communities in the area.
	Mitigation: Ongoing biota monitoring programs, such as the INEEL environmental surveillance program would continue, with appropriate responses implemented should undesirable impacts be identified.	Mitigation: Ongoing biota monitoring programs, such as the INEEL environmental surveillance program would continue, with appropriate responses implemented should undesirable impacts be identified.	Mitigation: Ongoing biota monitoring programs, such as the INEEL environmental surveillance program would continue, with appropriate responses implemented should undesirable impacts be identified.	Mitigation: Ongoing biota monitoring programs, such as the INEEL environmental surveillance program would continue, with appropriate responses implemented should undesirable impacts be identified.
Noise	No significant noise impacts from existing, ongoing INEEL activities.	Short-term minor increase in noise during construction. Negligible noise increase during operation.	Short-term minor increase in noise during construction. Negligible noise increase during operation.	Short-term minor increase in noise during construction. Negligible noise increase during operation.
	Mitigation: None anticipated.	Mitigation: None anticipated.	Mitigation: None anticipated.	Mitigation: None anticipated.
Traffic and Transportation	No adverse traffic or transportation impacts.	The level of service on local access highways would not change.	The level of service on local access highways would not change.	The level of service on local access highways would not change.
	Mitigation: None anticipated	Mitigation: None anticipated.	Mitigation: None anticipated.	Mitigation: None anticipated.

Table 3.8-1. Summary Comparison of Alternative Environmental Impacts (In Addition to Baseline).

Discipline	No Action Alternative	Proposed Action	Non-Thermal Treatment Alternative	Treatment and Storage Alternative
Occupational and Public Health and Safety	*Radiological Exposure and Health Impacts:*	*Radiological Exposure and Health Impacts:*	*Radiological Exposure and Health Impacts:*	*Radiological Exposure and Health Impacts:*
	The estimated fatal cancer incidence would range from $6.0x10^{-4}$ for the Maximally Exposed Individual (MEI) involved worker, to $5.5x10^{-5}$ for the MEI offsite individual.	The estimated fatal cancer incidence would range from $6.0x10^{-4}$ for the MEI involved worker to $5.5x10^{-8}$ for the MEI offsite individual.	The estimated fatal cancer incidence would range from $6.0x10^{-4}$ for the MEI involved worker to $8.5x10^{-10}$ for the MEI offsite individual.	The estimated fatal cancer incidence would range from $6.0x10^{-4}$ for the MEI involved worker to $5.5x10^{-8}$ for the MEI offsite individual.
		Over the 30 year operating lifetime the estimated fatal cancer incidence would range from 8.80×10^{-6} for the MEI involved worker to 1.7×10^{-6} for the MEI offsite individual.	Over the 13 year operating lifetime of the Non-Thermal Treatment AMWTP facility the estimated fatal cancer incidence would range from 1.56×10^{-8} for the MEI involved worker to 1.15×10^{-8} for the MEI offsite individual. (The Non-Thermal Treatment AMWTP Facility would not operate for 30 years.)	Over the 30 year operating lifetime the estimated fatal cancer incidence would range from 8.80×10^{-6} for the MEI involved worker to 1.7×10^{-6} for the MEI offsite individual.
	The population estimated fatal cancer incidence would be 2.04×10^{-4}.	The population estimated fatal cancer incidence would be $2.8x10^{-5}$.	The population estimated fatal cancer incidence would be $1.8x10^{-7}$.	The population estimated fatal cancer incidence would be $2.8x10^{-5}$.
	Long-term radiological population risks for the maximum 70-year lifetime over 10,000 years would be 0.07 latent cancer fatalities.	For the 30 year operating lifetime the population estimated fatal cancer incidence would be 8.0×10^{-4}.	For the 13 year operating lifetime the population estimated fatal cancer incidence would be $2.15x10^{-6}$.	For the 30 year operating lifetime the population estimated fatal cancer incidence would be 8.0×10^{-4}.

Table 3.8-1. Summary Comparison of Alternative Environmental Impacts (In Addition to Baseline).

Discipline	No Action Alternative	Proposed Action	Non-Thermal Treatment Alternative	Treatment and Storage Alternative
Occupational and Public Health and Safety (continued)	*Non-Radiological Exposure and Health Impacts:*	*Non-Radiological Exposure Health Impacts:*	*Non-Radiological Exposure Health Impacts:*	*Non-Radiological Exposure Health Impacts:*
	A hazard quotient of less than one, no adverse health effects would occur as a result of criteria and noncarcinogenic emissions.	A hazard quotient of less than one, no adverse health effects would occur as a result of criteria and noncarcinogenic emissions.	A hazard quotient of less than one, no adverse health effects would occur as a result of criteria and noncarcinogenic emissions.	A hazard quotient of less than one, no adverse health effects would occur as a result of criteria and noncarcinogenic emissions.
	Long-term carcinogenic hazardous chemical population risks for the maximum 70-year lifetime over 10,000 years would be $3x10^{-6}$ latent cancer fatalities.	The highest cancer risk is for carbon tetrachloride at the site boundary, at one cancer incidence in 263 million.	The highest cancer risk is for carbon tetrachloride at the site boundary, at one cancer incidence in 263 million.	The highest cancer risk is for carbon tetrachloride at the site boundary, at one cancer incidence in 263 million.
	Industrial Safety:	*Industrial Safety:*	*Industrial Safety:*	*Industrial Safety:*
	Annual injury/illness rates for INEEL operation and construction are 3.3 and 6.4 per 200,000 hours, respectively.	During 2.5 year construction: Estimated total injury/illness would be 385. Estimated total fatalities would be 0.96.	During 2.5 year construction: Estimated total injury/illness would be 385. Estimated total fatalities would be 0.96.	During 2.5 year construction: Estimated total injury/illness would be 385. Estimated total fatalities would be 0.96.
	Annual fatality rates for INEEL operation and construction are 0.016 fatalities per 200,000 hours.	During 30 year operation: Estimated total injury/illness would 135. Estimated total fatalities would be 0.65.	During 13 year operation: Estimated total injury/illness would 53. Estimated total fatalities would be 0.26.	During 30 year operation: Estimated total injury/illness would 53. Estimated total fatalities would be 0.65.
	Mitigation: None anticipated.	Mitigation: None anticipated.	Mitigation: None anticipated..	Mitigation: None anticipated.

Table 3.8-1. Summary Comparison of Alternative Environmental Impacts (In Addition to Baseline).

Discipline	No Action Alternative	Proposed Action	Non-Thermal Treatment Alternative	Treatment and Storage Alternative
INEEL Services	No change to INEEL services.	Electrical usage would increase by 35,022 MWh/yr.	Electrical usage would increase by 23,980 MWh/yr.	Electrical usage would increase by 35,022 MWh/yr.
		Propane use would increase by 925,000 gal/yr.	Propane use would increase by 185,000 gal/yr.	Propane use would increase by 925,000 gal/yr.
	Mitigation: None anticipated.	Mitigation: See water resources and cultural resources.	Mitigation: See water resources and cultural resources.	Mitigation: See water resources and cultural resources.
Accidents	In the anticipated frequency range, the waste box spill is the scenario with the highest consequences.	In the anticipated frequency range, the waste box spill is the scenario with the highest consequences.	In the anticipated frequency range, the waste box spill is the scenario with the highest consequences.	In the anticipated frequency range, the waste box spill is the scenario with the highest consequences.
	The dose to the MEI offsite would be 6.5 $x10^{-3}$ rem. The likelihood of fatal cancer would be 3.3 $x10^{-6}$.	The dose to the MEI offsite would be 6.5 $x10^{-3}$ rem. The likelihood of fatal cancer would be 3.3 $x10^{-6}$.	The dose to the MEI offsite would be 6.5 $x10^{-3}$ rem. The likelihood of fatal cancer would be 3.3 $x10^{-6}$. The absence of incineration and vitrification processes results in some reduction of risk.	The dose to the MEI offsite would be 6.5 $x10^{-3}$ rem. The likelihood of fatal cancer would be 3.3 $x10^{-6}$.
	Mitigation: INEEL emergency response planning currently in effect. Interdiction by INEEL accident recovery personnel following an accident to limit doses to offsite individuals at risk.	Mitigation: INEEL emergency response planning currently in effect. Interdiction by INEEL accident recovery personnel following an accident to limit doses to offsite individuals at risk.	Mitigation: INEEL emergency response planning currently in effect. Interdiction by INEEL accident recovery personnel following an accident to limit doses to offsite individuals at risk.	Mitigation: INEEL emergency response planning currently in effect. Interdiction by INEEL accident recovery personnel following an accident to limit doses to offsite individuals at risk.